

1
2 REMEDIAL PROJECT MANAGERS' MEETING

3 NASA/JET PROPULSION LABORATORY

4 7 June 2001

5
6 ATTENDEES:

7 Eric Aronson, CH2MHILL

8 Kimberly Gates, Navy/NASA

9 Marvin Hillstrom, Navy Southwest Division

10 (via telephone)

11 Hooshang H. Nezafati, CH2MHILL

12 Mark Ripperda, USA EPA

13 Peter Robles, Jr., NASA

14 Leticia Woodward, JPL

15 Richard J. Zuromski, Jr. NAVY/NASA

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25 Reported by: Louise K. Mizota, CSR 2818

Pasadena, California

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ARONSON: -- out of here obviously
(UNINTELLIGIBLE) production wells and the sources in
the sense of water we might be able to efficiently
handle a fluctuating water table. And with that
is -- you know, obviously, when water levels change
significantly in modeling and -- it's more of a
numerical type issue where you'll have calibration
rather convergence issues, due to water tables that
rise and fall considerably within your model.

The other issue is when you're citing
production from wells and you're looking at the
different layers, if some of those layers go dry,
you have issues with whether or not it reassigns
that water appropriately and does things like that.

So that's generally termed dynamic
allocation of water, and it's a nice feature, but
not presently in a lot of models but it is used in
modeling. The Burbank operable unit, that was a
consideration in their model selection criteria.
They looked at these types of things and
(UNINTELLIGIBLE) in their decision or at least their
recommendation on that that was pretty heavily

1 looked at.

2 RIPPERDA: Let's just take a break for a second.

3 ARONSON: Sure.

4 (Reporter arrived.)

5 (Discussion held outside the record.)

6 (9:44 a.m.)

7 ARONSON: One of the issues, just to talk a
8 little bit more about the specific demands of the
9 JPL site, is obviously -- is issues when you have a
10 lot -- large number of production wells, you have an
11 irregular geometry, one of the things is looking at
12 the issue of finite element versus finite difference
13 in which one would be preferable or, you know, best
14 helps us meet the needs and represent the site
15 efficiently without adding a whole lot of elements
16 here and a lot of grid blocks. And this just sort
17 of illustrates that point a little bit.

18 Here you have a site where you have a, you
19 know, say, a production well located in the middle,
20 you want finer detail, greater degree of resolution
21 out there. But that type of thing carries through
22 to the boundaries and ends up with a lot more
23 overhead with your elements and you get poor
24 anisotropy at the edge. Finite elements,
25 conversely -- I actually had the opportunity to

1 really grade those specifically around the area
2 we're looking at. So when you have a lot of
3 production wells, you can get the detail around each
4 of those without suffering, making decisions, well,
5 your model is going to be too big or we're going to
6 have too many elements further out, and trade-offs
7 like that.

8 Similarly to that, you have the opportunity
9 in finite element to precisely locate your wells.
10 We have some tight spacing with our monitoring wells
11 and production wells out there. You know, you have
12 another production well a little farther away. Then
13 you have this same type of situation here. You're
14 really going to start running into problems and it's
15 very difficult to precisely locate the wells.

16 Finite elements, you can go through between
17 these mode locations you can build right into the
18 model and have that flexibility to represent that.

19 Now, finite differences generally, it's a
20 little bit -- considered a conceptually simple
21 approach by some people probably because Mod Flow
22 has been around for a long time and has a
23 well-developed interface. A lot of people are more
24 comfortable with that. You kind of look at it
25 full -- you know, in detail. The American one might

1 be a little more simple, but once you're comfortable
2 with finite elements, it's really -- can be a more
3 robust approach, depending on your particular
4 problem.

5 Then all these things basically lend
6 themselves -- any type of model we want to be able
7 to develop the model efficiently, be able to import
8 information, export information, be able to analyze
9 that efficiently. It assists in, you know,
10 expediting the calibration of the model.

11 ROBLES: Hold on for a second.

12 ARONSON: Sure.

13 (Discussion held outside the record.)

14 ARONSON: So I think in a couple slides we'll go
15 right into looking at some of the features and some
16 of the things.

17 Obviously, one of the other considerations
18 is being able to efficiently develop the model,
19 being able to import and export data quickly for
20 being able to communicate on the back end and being
21 able to display results, but also, more importantly,
22 for the calibration process. Speeding that up gives
23 you an opportunity to spend a little bit more time
24 on working on the calibration as well.

25 And another important consideration is

1 that, you know, we will be able to export the
2 information and import the information but be able
3 to display it efficiently and in other types of
4 software.

5 So basically, starting out the model
6 evaluation, we identified a large number of
7 programs. And basically, the initial screening is
8 just identifying those that can handle pretty much
9 the flow and transport. Paring that down, applying
10 those criteria and a significant number of other
11 criteria that were discussed in the workplan, but I
12 didn't necessarily present, we pared that value
13 down, or the number of possible codes, down to
14 three. And those were CFEST, ModFlow and FEFLOW.

15 Basically, we took the opportunity at that
16 point to look at each of these in a little bit more
17 detail, spend a little bit of time. We did some
18 sample problems, test problems so we could compare
19 sort of the more qualitative things like efficiency,
20 the speed at which these things, particularly the
21 accuracy and the ability for it to converge with our
22 dynamic conditions of the JPL site.

23 Based on going through that process, it
24 really -- the best alternative, and it was fairly
25 clear for our particular, you know, geometry and

1 local site conditions was FEFLOW. FEFLOW is a
2 finite element, flow and transport. It actually has
3 a lot -- a great deal of additional options as well,
4 and it's a very sophisticated code.

5 So I'm going to go into at this point and
6 show you guys a little bit of what FEFLOW looks like
7 and just show you the state of where the model is,
8 just a real light overview of several -- couple
9 things that went into designing it, kind of
10 introducing you to the idea, and then we'll look at
11 a couple examples of the post-processing, just go
12 through some real quick details on that.

13 ZUROMSKI: We're going to call in another person
14 too, at this point.

15 ARONSON: Okay.

16 RIPPERDA: So who wrote FEFLOW?

17 ARONSON: FEFLOW was developed by
18 (UNINTELLIGIBLE). It's actually an East German
19 company. It was developed beginning early in the
20 late '70s, but it wasn't really until the opening up
21 of East Germany that it became more widespread in
22 its use. Now it's very popular in Europe and it's
23 increasingly -- more increasingly, or ever
24 increasingly more popular in the United States as
25 well. But it is -- its introduction here is a bit

1 younger.

2 RIPPERDA: So has CH2MHILL been using it for a
3 while?

4 ARONSON: This is probably the second project
5 we're really using it on right now. We did do quite
6 a bit up front making sure we check out things very
7 thoroughly, did a lot of communication with the
8 national labs and other places that have used it,
9 particularly for the Livermore site, which is a
10 Superfund site in California that uses FEFLOW, I
11 guess formerly used CFEST in 1998, replaced that
12 with FEFLOW. And some of the other national labs,
13 Pacific Northwestern National Labs, communications
14 with them and stuff like that, in addition to,
15 obviously, obtaining it and doing a lot with it.

16 (Telephone dialed.)

17 (Discussion held outside the record.)

18 ZUROMSKI: This is Marvin Hillstrom from the
19 Navy Southwest Division. He's unable
20 (UNINTELLIGIBLE).

21 Hi, Marvin. It's Richard Zuromski.

22 HILLSTROM: Hi, Richard.

23 ZUROMSKI: You're on the speaker phone now.

24 HILLSTROM: Okay.

25 ZUROMSKI: Okay.

1 HILLSTROM: This is Marvin Hillstrom, Southwest
2 Division at the Navy.

3 ROBLES: Okay.

4 ZUROMSKI: Okay. So I guess at this point you
5 guys want to go through and do the modeling, the
6 presentation of the modeling.

7 ARONSON: Yeah.

8 ZUROMSKI: You're not going to be able to see a
9 lot, Marvin, but --

10 HILLSTROM: No, I realize that.

11 ZUROMSKI: But we'll narrate as we go along.

12 HILLSTROM: I won't be able to see anything,
13 actually.

14 ZUROMSKI: Right.

15 RIPPERDA: Maybe just a few questions before you
16 go on this.

17 NEZAFATI: Absolutely.

18 RIPPERDA: So you're handling the free water
19 table. Can you handle storage in the vadose zone?
20 Do you have -- if the water table declines, do you
21 track the moisture content?

22 ARONSON: Capillary fringe?

23 RIPPERDA: Yeah.

24 ARONSON: Yeah. We're just simulating the
25 saturated portion of the model so there is not the

1 unsaturated vadose zone in these simulations.

2 RIPPERDA: I don't know how much water will be
3 coming down over several months, but, you know,
4 there must be some amount of water that --

5 ARONSON: Right. Generally, with all these --
6 any type of saturated flow code or when you're
7 simulating a saturated portion of flow which is
8 almost nearly, you know, a vast majority of the
9 cases is you're looking at the delay between when it
10 leaves the ground surface and the time it reaches
11 the water table. And you're looking at, you know,
12 accounting for that delay in the application. You
13 know, obviously, there's a time delay between when
14 precipitation falls on the ground and reaches the
15 water table. That's always something that's built
16 in to. So you do apply all that water. You don't
17 lose that water. You do lose, you know, just a
18 minuscule amount, you know, capillary fringe going
19 up and down. When you have coarser sediments out
20 here, you know, you don't have clays that are
21 holding the top -- lot of water.

22 RIPPERDA: Drainage is pretty fast.

23 ARONSON: Right.

24 RIPPERDA: I wasn't worried so much about
25 precipitation in the immediate areas. Just, you

1 know, the water table fluctuates rather rapidly by
2 10, 20 feet.

3 ARONSON: Right.

4 NEZAFATI: At least in the shallow end.

5 RIPPERDA: Yeah. And with your dynamic
6 allocation, so when a zone goes dry in a well --

7 ARONSON: Uh-huh.

8 RIPPERDA: -- does the model just take whatever
9 percent was coming from that and assign it to the
10 others, or do you have some kind of well bore model
11 that integrates with the model itself to reassign it
12 based on --

13 ARONSON: That's essentially -- it's looking at
14 the interval over which, you know, the production is
15 applied and it's looking at the relative
16 transmissivities of those units that are drawing the
17 water. So, you know, if it was a real permeable
18 unit that starts to go dry, obviously more pump
19 production that was coming out of that is
20 distributed.

21 But at each step it's dynamically looking
22 at what are the high gradients, what's the height of
23 the water table and it's allocating the water based
24 on, you know, those zones which have the ability to
25 take on more water or less water.

1 RIPPERDA: Okay.

2 NEZAFATI: One thing I might add about your
3 first question, how to handle the vadose zone and
4 unsaturated, maybe, flow, this code actually not
5 only handles saturated flow, but also has this
6 unsaturated component to it. That not so many codes
7 they have this. They have separate codes for
8 unsaturated flow, as you know. And we think that
9 we're going to be using that. It's going to be come
10 in handy when you look at distributing this water
11 from the spreading basins to the groundwater
12 because, as you know, we have about 200 feet or so
13 of the vadose zone and the water doesn't just flow
14 right away.

15 RIPPERDA: Right.

16 NEZAFATI: It really creates a mounding, if you
17 will, which is responsible to some great deal to
18 this rather local reversal -- reversal of the flow
19 direction that we were seeing, you know, in some of
20 the contour maps that have been put together in the
21 RI.

22 RIPPERDA: So rather than just applying a source
23 to those nodes --

24 NEZAFATI: We're going to be trying to see if we
25 can simulate it as an unsaturated, you know, flow

1 and then distribute that as reasonably as we can to
2 feed into the groundwater.

3 RIPPERDA: So in the solution matrix is that
4 all -- is it completely integrated, or do you have
5 like a separate 1-D model that then determines what
6 the source would be so you have a parallel?

7 ARONSON: Yeah. It's initially basically --
8 we'll look at the distribution and determine sort of
9 what would happen. But we were going to do that in
10 sort of the preprocessing stuff, in two-dimensional
11 looking at that. And then once we get an idea of
12 that delay that I was trying to describe and, you
13 know -- you know, how -- roughly how much is applied
14 up here, but the time of how much -- maybe it
15 reaches here a month later, a month and a half later
16 and the volumes are going to be, you know, somewhat
17 shifted. So we can look at that to try to draw some
18 conclusions to begin with so that we can apply it
19 when it hits the water table, appropriately. If you
20 ran the whole simulation, if you had the option of
21 doing a full saturated and unsaturated --

22 RIPPERDA: But if you ran a couple --

23 ARONSON: It would run -- you know, you would be
24 solving that. It would be highly nonlinear. It
25 would take an incredible amount of time.

1 NEZAFATI: Yes. Exactly.

2 ROBLES: Hooshang, when you said "flow
3 reversals," what do you mean by that?

4 NEZAFATI: What I meant was that you have a
5 mounding in the, basically, groundwater because of
6 the spreading basins. You're dumping a lot of
7 water. So the water has to go through the vadose
8 zone to reach to the groundwater, but it doesn't
9 quite dissipate, depending on the make-up, texture
10 of the vadose zone and the rate that's being applied
11 and what area it's being applied to. So it becomes
12 like a mound at -- initially, at least, but then it
13 dissipates, basically, gradually.

14 So that mounding may be -- and again, this
15 is a local scale. Nothing really to -- beyond,
16 basically, those spreading basins, that you may see,
17 basically, the direction of the groundwater flow in
18 reverse of what you would expect. But this is,
19 basically, until this sort of mounding is
20 dissipating and the feeding into the groundwater.
21 But it's local. It's not extensive and you cannot
22 imply -- or we can talk about that in more detail,
23 but that's what I meant. Just a local, basically,
24 reversal because of the spreading basins.

25 RIPPERDA: Oh, darn.

1 GATES: You want it to go uphill?

2 RIPPERDA: That's -- not that we don't know what
3 flow reversal is, but the size of a flow reversal
4 is --

5 NEZAFATI: Yeah. I know that it's a sensitive
6 issue, but we can talk about it in more detail.

7 ROBLES: I wanted it on the record so we can --

8 NEZAFATI: Exactly.

9 ROBLES: See, we use flow reversal. We all
10 understand it, but when people read the transcripts,
11 there is this view of the whole Raymond Basin
12 flowing and they have to understand there's
13 localized effects --

14 NEZAFATI: It's localized effect.

15 ROBLES: -- and regional effects.

16 Okay. Go on, Eric.

17 ARONSON: One of the tools we're using, kind of
18 go back and forth with FEFLOW, and one of the things
19 that's important when we're looking at any models
20 is, you know, obviously GIS is a really powerful
21 tool and it allows us to have a great deal of
22 different information, to look at, visualize it, you
23 know, spatially against each other or on top of each
24 other. So like most of ModFlow pre-processors,
25 post-processors and FEFLOW have the opportunity to

1 bring in GIS data very easily, relate that
2 information, assign properties based on doing that
3 type of thing.

4 What I'm showing you here, basically, the
5 yellow is sort of the outline of -- the yellow is
6 basically an outline of the -- let's see if it will
7 refresh real quickly and -- let me shut this down
8 real quick and open it back up.

9 ZUROMSKI: Eric, is all of this on your computer
10 right now? You're not linked into the -- your
11 server at the site. So that's why it would be --

12 NEZAFATI: Delays. Takes a little longer.

13 ARONSON: Yeah. It was actually up just a
14 couple minutes ago. So I don't know particularly
15 what happened.

16 Here it's back and it's -- everything is
17 there.

18 Just basically, the yellow outline is sort
19 of the extent of the alluvium as mapped by DWR. But
20 you could see here -- and I also -- what I am
21 showing is a base map or a photo base map underneath
22 the site. Kind of going in a little tighter, the
23 black line represents the extent of the model
24 domain. As you can see, it doesn't extend out along
25 the edges, does not extend out towards, necessarily,

1 the edge of alluvium.

2 What we have there is basically bedrock is
3 rising fairly steeply along, you know, obviously the
4 sides you can see out here. At that point, looking
5 at the water table, basically the water table
6 intersects bedrock at that point. These areas off
7 to the side are not saturated alluvium. It's
8 important within the model, obviously, that we're
9 representing the saturated zone, and that's what
10 we're modeling.

11 ZUROMSKI: Can you overlay the extent of the
12 ModFlow model on that as well?

13 ARONSON: Yeah. That's the extent of the
14 ModFlow model that was previously done. Like, one
15 of the things -- features you can see in this
16 contours of bedrock, this is a topographic high of
17 the crystalline bedrock, the underlying surface
18 bedrock. And here it's called Monk Hill.
19 Basically, there's a significant rise where it
20 actually intersects the water table and creates an
21 area where, you know, flow does not come through
22 here. It obviously goes around because it's in
23 contact with the bedrock.

24 Also shown on here are the locations of
25 the production wells and the dense monitoring well

1 network for the JPL site.

2 So basically, we've created some of these
3 contours of the different layers for the different
4 units within the model. And being able to prepare
5 our information and, you know, visualize that and
6 determine the extent of the model, we can go ahead
7 and bring that into FEFLOW, basically.

8 What I'm showing you here against the base
9 map or the background map is actually the
10 transportation. It's roads, freeways.

11 Here's the mesh that was developed for the
12 JPL groundwater model. You see it's much more dense
13 in the area particularly around locations of all the
14 production wells where we can build those
15 specifically right into the mesh.

16 Here's downgradient production wells.
17 This particular location is the upgradient injection
18 and production wells that are located up here, the
19 La Canada Irrigation District wells and the Valley
20 wells.

21 And then basically, this is sort of -- the
22 finer detail generally represents the area which --
23 we're interested in much finer detail and ultimately
24 being able to simulate transport. We want to have
25 finer detail within that area.

1 I'm just going to really quickly show you
2 a three-dimensional view of this model, give you a
3 couple interesting things, I think. One of the
4 things is currently -- showing right here is the top
5 of the map. One of the things you can see looking
6 at this, you can see, obviously, the four layers
7 coming through the model and the extent of those
8 within the model. You can also get a kind of a feel
9 for sort of the slope out there.

10 Now, this is a little tilted, but you can
11 see that down in the JPL area, down in this kind of
12 a lower area, bedrock actually -- or the ground
13 surface actually slopes downward towards the site
14 from both the east and the west directions.
15 Direction of groundwater flow along this east side
16 is basically sort of along this outer boundary and
17 straight down. But it gives you a good feel for the
18 surface topography out there.

19 And you can do all sorts of things with
20 your model results in the back end of looking at
21 things and including, you know, looking inside your
22 model. I'm getting lost in things like that. I'll
23 just go ahead and exit that right now. Backed up
24 way too far.

25 Just to kind of show you, right now we're

1 in the process of calibrating the model, but to
2 introduce some of the other aspects or features of
3 the model, just a real brief introduction, just kind
4 of look at this example or demonstration problem.
5 Basically, a situation where you have a couple
6 downgradient production wells in the area and a
7 couple sources, a waste disposal pit and a seepage
8 pond. And basically, one of the wells was
9 experiencing impacts due to contaminants.

10 And basically, this was a FEFLOW model
11 that -- flow, transport and also used particle
12 tracking to quickly analyze that. So looking at
13 that model in FEFLOW, we can go ahead and exit out
14 of this one.

15 Now, it's a little difficult to see just
16 because a laptop isn't the best way to house FEFLOW
17 onto a larger monitor, so you have to really scroll
18 around, but it's much more efficient done in
19 different -- or a larger screen.

20 GATES: Now, is this the German example that you
21 showed us before?

22 ARONSON: Yeah.

23 GATES: Located in Germany?

24 ARONSON: Yeah. There's basically a lake in the
25 southern portion of the site down here. There's

1 bedrock up along the northern portion and there's a
2 river along the eastern boundary.

3 Here's looking at that model within
4 FEFLOW. We'll go ahead and quickly look at some
5 results that I ran so we can get an idea of some of
6 the particle tracking and just look at a little bit
7 of the solute transport as well.

8 This is a transient model run for 20
9 years. Basically, they looked at the source areas,
10 made some assumptions about the strength and the
11 size of those sources and then did some forward
12 simulations to try to determine whether or not --
13 which of these sites, or if at all, these sites were
14 the ones that would be impacting the downgradient
15 production wells.

16 So what we'll do quickly is, first of all,
17 we'll just look at a little particle tracking.
18 Particle tracking. We can basically do forward
19 particle tracking where we can try to drop that in
20 and look at that in the forward direction and see,
21 you know, what's reaching the wells.

22 We can also look at this backwards,
23 looking basically at the capture zone of that water,
24 delineate, sort of, the area, you know, under these
25 particular conditions that are contributing water to

1 the well.

2 Now, the forward particle tracking -- go
3 ahead and just set a couple options. It doesn't
4 save the options, actually.

5 Quickly go ahead and do some forward
6 particle tracking, basically releasing particles
7 upgradient and watching where those particles end
8 up, kind of getting a feel for where particular
9 sources of water under these particular conditions
10 end up. You can see what gets captured by the well.
11 Sort of a quicker effort for looking backwards in
12 time, wanted to see what contributes to that well is
13 we can do multiple paths around a single well and we
14 can just go through and very quickly select a
15 particular well and look backward in time.

16 Actually, since I'm in a shallow layer
17 right now, backward in time makes me pop up right at
18 the surface, of course.

19 Let me go ahead and do a deeper layer.
20 Basically, I just moved down to a layer that's
21 probably about midway through where the actual
22 well's located. You can do this for each of the
23 different layers to look at where particles are
24 starting at that particular elevation and up.

25 We'll go ahead and -- and we could do that

1 for both wells and kind of get a picture of where
2 particles starting, going backward in time, end up
3 capturing water that's contributed to that.

4 RIPPERDA: How about if you looked at someplace
5 that wasn't a well?

6 ARONSON: We can do that as well. Right now I
7 happen to be -- I set the option to do from a well,
8 where it releases all sorts of points. You can set
9 an option to do backward and then set up a line and
10 just release points along the line or delineate a
11 polygon and release points along a polygon or the
12 edge of a plume. Say if you want to look at
13 everything starting above 5 M -- or no -- above the
14 MCL. You can set a set of particles around that
15 level, the plume or the interpretive plume, and let
16 that go forward in time and see where those end up.

17 ROBLES: What are you thinking, Mark?

18 RIPPERDA: Oh. I was just asking a question.

19 NEZAFATI: The answer is yes.

20 ROBLES: We think it's a good tool for us to
21 look, you know, because one of the things is we want
22 to make sure that where we put any treatment well,
23 that we capture as much of the plume as possible.

24 ARONSON: Sure.

25 Just real quickly, there's -- also, we can

1 look at this particle tracking in three dimensions
2 and kind of get an idea of that, which is a pretty,
3 I guess, really interesting option. But right now
4 we got kind of the map overlaying that. Let me go
5 ahead and turn off the map again.

6 We could go ahead and do -- start multiple
7 path lines along -- around a well, go in, basically
8 do the same type of thing we just did a second ago.
9 I'm going to select that. Then you can actually
10 look at it in three dimensions and get an idea of,
11 you know, vertically its movement throughout there.

12 Now, I started about 100 particles around
13 the well at that particular elevation, so it's not
14 quite as clear as if you had one or two, but it
15 gives you sort of the ensemble idea of what's
16 connected to there. You can also export all this
17 information, you know, by what particular elevation
18 it's in and display it in other types of software,
19 overlay it with base maps. And you can also display
20 the base maps in here.

21 And then just real quickly going into
22 (UNINTELLIGIBLE) solute transport in the forward --
23 or at any particular time. You can do that pretty
24 quickly by -- we'll look at it at time 20 and see
25 what that happens to be. Basically, you get an idea

1 of what the plume looks like. See on the legend
2 basically the source areas are set at about 500
3 milligrams per liter and you're looking at what
4 happens to be impacting the well in these various
5 concentrations.

6 And you can export all this types of
7 information as well. Just going back to Arc View,
8 we can turn on -- here is that plume at 20 years.
9 We could also overlay it with the capture zone and
10 get a feel for that. You get the options of also,
11 you know, looking at the plume at other times and
12 kind of getting a feel for its movement through
13 time. And all this types of information can also be
14 exported for, you know, animation or kind of look at
15 it sequentially as it moves for particular, you
16 know, scenarios.

17 So that's a little bit of an introduction
18 just -- sort of into some of the tools that were
19 selected particularly for this and where we're at in
20 developing the JPL groundwater model.

21 Any questions or --

22 ZUROMSKI: Seeing --

23 RIPPERDA: Looks good.

24 ROBLES: What do you think, Mark?

25 RIPPERDA: Looks perfectly suitable.

1 ROBLES: Okay.

2 ZUROMSKI: I think once we get the calibrations
3 completed and they've calibrated the model and we
4 get our actual -- our data into our model, it will
5 show, obviously, a lot more than just the
6 simulations that -- for demonstrations.

7 NEZAFATI: Yeah, exactly.

8 ROBLES: We want to give the RPMs a presentation
9 of that and take your comments on it because this
10 has got to be, as we said before, this is the long
11 pole in the tent for the EE/CA, that we need to look
12 at this so that we can justify our alternatives and
13 present that so that way it passes public scrutiny.

14 RIPPERDA: Uh-huh.

15 GATES: So everybody gets to go to Santa Ana,
16 then.

17 ROBLES: Sure. Everybody can go to Santa Ana.

18 GATES: Can you load the model on that?

19 ARONSON: Yeah.

20 GATES: I didn't think you could. You could?

21 ARONSON: Yeah. Ultimately, yeah, I can move
22 everything over. This is probably just a little
23 less powerful and it's --

24 GATES: Right.

25 ARONSON: -- not as easy to display stuff.

1 GATES: That's what I was thinking.

2 ARONSON: But yeah. Definitely.

3 ZUROMSKI: So whether we have -- when we do have
4 the model complete, whether we do it in Santa Ana or
5 here, we'll have to -- we'll make that choice at the
6 time. Right?

7 NEZAFATI: Yeah. We've been looking forward to
8 that opportunity.

9 And, Mark, we have close to a dozen
10 professionals that are assisting us on this project.
11 So -- and we'll be able to give you a full
12 presentation of the different aspects of the
13 technical work we are doing, including the progress
14 that we have made on the model. So we're looking
15 forward to that, and we're inviting you to come and
16 visit us in Santa Ana.

17 RIPPERDA: So a dozen professionals. Does that
18 mean Eric is an amateur?

19 NEZAFATI: No. No. Including. Including.
20 Well, he is a very good professional.

21 ROBLES: Mark, I wanted to ask you just what did
22 you think about -- you know, we expanded the area of
23 the ModFlow for FEFLOW, because we felt that we
24 needed to get into the major areas and other issues
25 that this could be used at in the future. We

1 thought that, you know, first case is that expanding
2 was a little too much, but then talking with Eric,
3 that it seemed to be the best thing is to look at
4 the alluvial soil, saturated soil because that's
5 what we have to model all the way through.

6 ARONSON: One of the really interesting is --
7 upgradient, basically, there's a flow divide between
8 the Verdugo Basin and the Raymond Basin. Basically,
9 the bedrock rises and then it slopes back down on
10 the other side. That represents, really, a strong
11 boundary of -- a strong physiographic boundary for a
12 model boundary. It involves a stronger level of
13 detail. I think it's much easier to justify and,
14 you know, have a better feel for where the water is
15 coming from rather than having a boundary located a
16 little farther down.

17 RIPPERDA: No. That makes sense.

18 ZUROMSKI: And part of our discussions with the
19 City that you participated in is expanding the model
20 downgradient, the boundary, so that we can help --
21 assist them in finding locations for additional
22 production wells in the future as well. And the
23 area that we had was originally -- would be more
24 limited, so we could possibly expand the boundary as
25 part of that work. So there's lots of reasons for

1 expanding the boundary.

2 RIPPERDA: So, then, underneath the fourth layer
3 or where lower layers pinch out, you have either the
4 second or first layer sitting on bedrock, those are
5 all no-flow boundaries, right, underneath?

6 ARONSON: Correct.

7 RIPPERDA: And all around the edges, the
8 northern edge and of that southwestern edge.

9 ARONSON: Southwest. Along here?

10 RIPPERDA: Yeah.

11 ARONSON: Yeah. These are all bedrock
12 interfaces, basically, along here and along here.

13 ZUROMSKI: The yellow is the Raymond Basin
14 boundary. Correct?

15 ARONSON: Yeah. That's basically the edge of
16 alluvium for the Raymond Basin. It extends up
17 to -- the Raymond Basin extends up in the mountains.
18 As far as -- talking about like the Raymond Basin as
19 described for Regional Water Quality or State Water
20 Quality Control, you know, divides it up and
21 includes the mountains as well with the actual
22 basins.

23 RIPPERDA: So at various points there where
24 there is recharge coming down from washes, you don't
25 have no-flow boundaries. Right?

1 ARONSON: Right. It's part of the water budget
2 that's being developed or has been developed. And
3 then looking at that is addressing sources of water
4 through drainages and how that contributes along,
5 like the Arroyo Seco in this area particularly.
6 Surface water, there's really not -- most -- the
7 surface water bodies are aligned with the exception
8 of, basically, the Arroyo Seco through this local
9 area just north of Devil's Gate Dam.

10 RIPPERDA: And how about inflow from the
11 northwest?

12 ARONSON: Basically, looking at the contours of
13 water levels and actually the elevations of bedrock,
14 water levels kind of, obviously, go up and down in
15 time, but they range basically between here and
16 here. There's portions that indicate that the water
17 levels at the very edge of the basin, and this has
18 been found in other studies as well, are
19 unsaturated.

20 Basically, this being a topographic high,
21 water that falls in these areas runs this way and
22 runs this way, sort of, at that point. And there's
23 not enough sustained water in this, you know, little
24 area coming in that's going to make this anything
25 more than nominally saturated significantly through

1 there. So that is a no-flow boundary between a flow
2 divide.

3 RIPPERDA: So what's the inflow to the whole --
4 you know, to everything northwest of here?

5 ARONSON: Source of the water up here,
6 basically? The sources of the water include
7 precipitation, natural recharge that falls basically
8 on the alluvium and drains into there, which is deep
9 percolation from natural recharge. We actually have
10 irrigation recharge, or applied waters in this area.

11 And also, this area is -- a significant
12 portion of this area is unsewered. They have -- do
13 have an aggressive sewerage program in the La Canada
14 area, but they've only done a few or a smaller
15 number of streets thus far, so there's return flows
16 from sewage as well.

17 RIPPERDA: So what kind of data do you have on
18 water balance, on water inflow rates up there? How
19 are you going to assign that in your calibration
20 runs?

21 ARONSON: Basically, we look at the entire water
22 balance to begin with. Before you even get into
23 modeling, we develop a water budget saying, you
24 know, looking at the water levels and seeing how
25 that's changed, are we seeing an increase in water

1 levels. Is there more water coming into this area
2 than leaving, and looking at how much is leaving and
3 balancing those things out and looking at what would
4 account for the differences, where is the water
5 coming from, identifying sources.

6 And there are volumes throughout. For
7 things like applying recharge you look at land use.
8 They look to see that, you know, how is the land
9 being used to see, you know, if it's largely paved
10 or industrial. Commercially, you're going to have
11 significantly less recharge there versus
12 residential. You can also for the -- after
13 identifying the unsewered areas, you can look at
14 sort of typical populations in those areas and draw
15 some conclusions about water use. And there's
16 definitely engineering background to developing
17 estimates of those return flows and things like
18 that.

19 RIPPERDA: And then are your downgradient
20 boundaries constant head, constant pressure?

21 ARONSON: This boundary along here is a --
22 represents basically sort of a long-term flow line.
23 Water coming down here basically kind of continuing
24 in the Raymond Basin watermaster -- Raymond Basin
25 Management Board contour maps plus some, you know,

1 information we've reviewed and compiled for creating
2 contour maps outside the area. This is generally a
3 flow line. We have -- flow line generally, as long
4 as it's not influenced by the production well,
5 represents a flow divide for -- you know, because
6 water is flowing along that line and not crossing
7 across that. That represents a good boundary.

8 Down here, this is actually a -- can be
9 fixed flux or fixed head boundary along this area.

10 RIPPERDA: Are your calibration runs, are any of
11 them going to -- how long are you going to run a
12 calibration run for?

13 ARONSON: Basically, we're looking at a period
14 from -- a flow period of data from 1995 to 2000 or
15 right up to recent conditions, taking advantage of
16 the most recent, you know, information. So that's
17 sort of where we leave off on calibration.
18 Obviously, we're set to run scenarios going forward.

19 RIPPERDA: Do you run any longer term ones that
20 go for, you know, 100 years or so, without worrying
21 about calibration per se, but just worried about
22 reaching steady state?

23 ARONSON: Right.

24 NEZAFATI: In the future, you mean, for the --
25 evaluating the alternatives, to look into --

1 RIPPERDA: No. I mean actually going back to
2 make sure --

3 NEZAFATI: Oh, going back.

4 RIPPERDA: -- what you have now will actually
5 work in steady state. So you assume some kind of
6 average input.

7 NEZAFATI: Exactly.

8 RIPPERDA: You've got your average output flux
9 and you let it run for just, you know, 100 years to
10 see that it doesn't flow up or that you don't get
11 wildly high water levels at some point or --

12 ARONSON: Right.

13 NEZAFATI: Exactly.

14 ARONSON: That's actually sort of the initial
15 phase of the calibration, sort of looking at that
16 balance and making sure that, you know, it sustains
17 a steady state run, that the balance -- amount of
18 water that's coming in balances the amount of water
19 coming out and appropriately assigned and you have
20 the water budget well understood, you know, before
21 then, then you can step in and take it to the next
22 step of the calibration.

23 RIPPERDA: So you actually do run it for a long
24 period of time?

25 NEZAFATI: Yes, we do. Actually, we're planning

1 to go back like in 1939 time frame and then using
2 these average, basically, water levels and average
3 flow conditions and running the model. And
4 specifically looking at the plumes, the way that we
5 see it now, at least it's been documented, see if
6 the groundwater conditions, by that I mean flow and
7 basically gradient and directions, are in tune or
8 consistent with the plume maps that we have seen out
9 there and then use that as a means of calibrating
10 model for solute transport. So we're going to be
11 doing that.

12 RIPPERDA: Good. I wasn't hearing that at all.

13 NEZAFATI: Yeah.

14 RIPPERDA: That's one of the things that I care
15 the most about, is can you run it for 1,000 years
16 and have it reasonably approximate the way it looks
17 now?

18 NEZAFATI: As long as we have some ways and
19 means of supporting that or comparing that with
20 information that we have. I mean, that could be --
21 model is a nondestructive tool, so you can -- as you
22 know, you can run it for, you know, extended periods
23 of time.

24 ARONSON: As you go farther back in time,
25 obviously, the data is considerably more limited in

1 the particular --

2 RIPPERDA: Right. 1,000 years is too big.

3 NEZAFATI: Yeah. Yeah.

4 RIPPERDA: But 100 years or so. It's like we
5 used to run models for thousands of years just to
6 make sure --

7 NEZAFATI: 10,000 for the Yucca Mountain. I
8 know.

9 ARONSON: Of course, for those types of
10 purposes. Yeah. And a lot of times when you're
11 running it for a long, long transient you're just
12 marching towards steady state. We're just getting
13 to that, so you can look at what the steady state,
14 sort of, result is. And we'll be doing steady state
15 just as a check on the water budget looking at --
16 and locking in, you can lock in a lot of material
17 properties to begin with during that initial phase.

18 ROBLES: Are the records in hieroglyphics that
19 go back that far?

20 RIPPERDA: No. You just assign your water
21 budget and it's obviously mass in equals mass out.
22 You're not going to completely blow it up, but you
23 make sure that at least in steady state --

24 ARONSON: Right.

25 RIPPERDA: -- it reasonably approximates reality

1 rather than --

2 ROBLES: That's a calibration method.

3 NEZAFATI: Yeah. I think you have to always
4 think about uncertainty, what do you have as far as
5 tangible data, you know, what do you have and how
6 you can compare that with, basically, your model
7 simulations. And then your accuracy is basically
8 dependent on, really, what you have to compare your
9 results to.

10 ROBLES: Now, Eric, do you feel more comfortable
11 with FEFLOW than ModFlow?

12 ARONSON: I particularly definitely do, and
13 particularly for this -- any type of -- well, when
14 you have such a dynamic site and you're covering,
15 you know, a decent amount of area you have all this
16 discretization around these particular production
17 wells and you're carrying that through the
18 boundaries, you're going to resolve lot of overhead.

19 Also, this happens to be, I think, a
20 really robust tool. ModFlow has been so well
21 developed on the road and that's -- you know,
22 contributes to its popularity, but there's a lot of
23 great finite element methods out there. I spent a
24 lot of time with finite elements and finite
25 difference in the past. And for this particular, I

1 think, finite element does suit the problem better.

2 ROBLES: Okay.

3 ARONSON: And FEFLOW suits the problem better.

4 NEZAFATI: Did we answer your question on the
5 groundwater budget? Did we answer that? Do you
6 want me to elaborate a little more on that or --

7 RIPPERDA: No. I think since you're basically
8 applying sources, but -- and then you've got a
9 constant flow out. Obviously, if you have mass in
10 equals mass out --

11 NEZAFATI: Exactly.

12 RIPPERDA: -- you're not going to go dry or
13 you're not going to like have it like geyersing out.
14 So that almost seems unfair, because obviously you
15 can make it converge very readily by having constant
16 flux both in the input and the output.

17 ARONSON: Well, yeah. On the output side of
18 things you're looking at, you know, time-dependent
19 values, looking at water levels rising and falling
20 and those types of issues. I guess within a model
21 you're always going to be assigning recharge and
22 that's always going to be assigned as a flux and
23 you're always going to be assigning all those types
24 of things, you have to go in and out, because
25 those -- some of the other real metered values

1 are -- you know, obviously groundwater production is
2 measured at the meter and, you know, those are
3 really well recorded values of what's being
4 extracted there, and they also track what's being
5 spread out here.

6 RIPPERDA: No input has to be a flux. You know,
7 I don't have a problem with what you're doing. This
8 looks like you guys are doing a great job.

9 ARONSON: The key is making sure that that
10 downgradient boundary isn't driving this simulation
11 and it's far enough away --

12 NEZAFATI: Exactly.

13 ARONSON: -- that it doesn't impact your
14 results.

15 NEZAFATI: It's not impacting the results.

16 THE REPORTER: One at a time, please.

17 ARONSON: It could be a (UNINTELLIGIBLE) or a
18 flux boundary. And, you know, you choose the same
19 type of result. It's not going to be driving the
20 simulation result, and that's an important
21 consideration when locating that boundary.

22 ROBLES: Okay. That was Item 3.

23 ZUROMSKI: Actually, we're going to go back to
24 the beginning of the whole presentation.

25 NEZAFATI: I was just going to suggest that I

1 start with mine --

2 ZUROMSKI: Sure.

3 NEZAFATI: -- while you're at it.

4 ROBLES: Before we start, let's introduce

5 ourselves.

6 ZUROMSKI: We'll go back. We'll go back to the

7 full beginning of the meeting, introduction.

8 NEZAFATI: Should I start? You want to start?

9 ROBLES: Peter Robles from NASA/JPL.

10 RIPPERDA: Mark Ripperda from U.S. EPA.

11 WOODWARD: Leticia Woodward with JPL.

12 NEZAFATI: Hooshang Nezafati with CH2MHILL.

13 ARONSON: Eric Aronson, CH2MHILL.

14 ZUROMSKI: Richard Zuromski with NASA and the

15 Navy.

16 GATES: Kimberly Gates, NASA and Navy.

17 ZUROMSKI: And on the phone?

18 HILLSTROM: Marvin Hillstrom from Southwest

19 Division, Navy.

20 ROBLES: Okay.

21 ZUROMSKI: Great.

22 ROBLES: Let's start with Item 1, which is

23 Project Overview and Schedule. We had just finished

24 Item 3, Modeling Demonstration.

25 So, Hooshang, why don't you go for it.

1 ZUROMSKI: Do you want to do the -- this is
2 actually us as well.

3 ROBLES: Okay. Fine. Whatever.

4 ZUROMSKI: I just wanted to -- I think Hooshang
5 is probably going to get into some of the items on
6 the OU-1 and 3 schedule for the work we're doing
7 with the EE/CA, the modeling and other work in OU-1
8 and 3.

9 But as an overall project overview I just
10 wanted to talk quickly about some of the upcoming
11 events that we're going to have. Some of them we'll
12 get into more detail later on in the meeting today.

13 But, for example, for OU-2 right now, we
14 have one more public meeting coming up on June 20th,
15 and then during -- before June 20th and then, of
16 course, 30 days after June 20th we'll be working on
17 the responsiveness summary. And we will be
18 submitting to the RPMs, including David and Richard,
19 our initial draft of what we believe -- we've gotten
20 probably, what, about 25 comments so far in the mail
21 and the ones that we received at the public meeting,
22 and we'll be responding to those and submitting them
23 to you guys, make sure we all concur in the
24 responses and then submitting that to the commission
25 of record. So that's generally what's going on with

1 OU-2 and schedule.

2 And at this point in time it looks like,
3 as far as scheduling purposes go, we should have a
4 draft ROD and probably a draft workplan for
5 expanding the pilot study sometime towards the end
6 of July/August time frame to you guys for review.
7 And that would put us to -- hopefully put us to a
8 final ROD sometime towards November of this year.
9 And that's for OU-2.

10 OU-1 and 3, we're looking at finalizing
11 all the modeling that Hooshang just discussed by the
12 end of August of this year, and at the same time in
13 September of this year we're going to be looking at
14 our internal draft EE/CA. And then sometime later,
15 towards October time frame most likely, we'll be
16 moving towards our draft EE/CA, which we'll be
17 submitting to you again for review, to the RPMs for
18 review.

19 And that is our general schedule for the
20 main event that we're working on right now. And I
21 think Hooshang is going to go into more detail on
22 all the work that they're doing on OU-1 and 3 and
23 some more specific time lines and things that
24 they're working on. So hooshang --

25 NEZAFATI: Thanks. Maybe I should stand here.

1 ARONSON: Sure.

2 NEZAFATI: What I would like to do today is to
3 give you a brief status report on the work that we
4 are doing for the JPL site. As Eric mentioned, when
5 we came on board on this project, we started with
6 the main task of developing a groundwater model for
7 the JPL site.

8 We reviewed the data, the site-specific
9 data, the regional data, as well as the existing or
10 previous modeling work, and then by consulting with
11 NASA/JPL and identifying a set of specific
12 objectives for the JPL site, we tried to, by
13 reviewing the data, come up with a technical
14 approach that how we're going to be developing a
15 model which addresses those objectives.

16 As Eric mentioned, we prepared a
17 groundwater modeling workplan, which basically
18 summarized the technical approach that we developed
19 to construct this groundwater model. And we used,
20 basically, a rather new code called FEFLOW, as Eric
21 mentioned, to construct a groundwater model for the
22 JPL site. And this model, as Eric explained, it's
23 both for flow and solute transport purposes.

24 The other major task that we are involved
25 with is performing an engineering evaluation of

1 treatment technologies for the groundwater, focusing
2 on VOCs and perchlorate in particular, and looking
3 into both ex-situ and in-situ technologies.

4 We are also looking into evaluation of
5 applicability of policies, such as the DHS' policy
6 97-005 and AB 26 -- Assembly Bill 2646 to Arroyo
7 Well. This is, again, in relation to finding out
8 whether -- what it's going to take us as far as
9 regulatory requirements are concerned to potentially
10 open or reactivate this Arroyo Well and put that
11 back on line, or whether some other options needs to
12 be looked at.

13 We also, as part of our technical work, we
14 looked at -- we looked at basically updating the
15 perchlorate trend analysis for Well 52. And again,
16 as some of you might know, Well 52 is next in line
17 to Arroyo Well. And then the concerns are that
18 whether the -- how the perchlorate is impacting this
19 well. And based on the previous information, a
20 trend analysis was done.

21 And what we did was that we used the most
22 recent information to update that trend analysis and
23 then see that -- how the impact is being, basically,
24 projected by the observed information that we have
25 at this -- at this well.

1 We also looked at obtaining some
2 additional data to support the ongoing work, and
3 most -- particularly the groundwater modeling work,
4 which I'm going to be talking about just a little
5 bit more later on.

6 We're going to be also evaluating the
7 ARARs for the site, and also we're going to be
8 shortly starting on preparation of an engineering
9 evaluation and cost estimate for the groundwater for
10 the JPL site.

11 Now, this EE/CA, again, engineering
12 evaluation and cost estimate, is sort of taking the
13 center stage for this JPL site. And then it's going
14 to be benefiting from the different pieces of the
15 technical work that we're currently involved with.
16 And to capture that essence, I have this sort of a
17 diagram here that shows at the center we have the
18 EE/CA and it shows how the different technical work
19 they're going to be basically -- they're connected
20 to one another and ultimately they're leading into
21 supporting EE/CA for this site.

22 Starting with groundwater modeling, which
23 is going to be benefiting from the additional data
24 that I'm going to be describing that later, namely,
25 large-scale pumping tests, as well as potentially

1 collecting spinner-logging data from the City of
2 Pasadena wells. And we're going to be developing
3 alternatives for EE/CA, and the groundwater is going
4 to be used to evaluate the effectiveness of those
5 alternatives.

6 Parallel to that we're looking into
7 treatment technologies for the groundwater and we're
8 going to be putting together treatment trains to
9 address the treatment of VOCs, perchlorate and the
10 chemicals of concern in the groundwater. And that's
11 going to be also leading to the EE/CA.

12 We also, parallel to that, we're looking
13 at ARARs issues and at DHS policy 97-005 and
14 AB 24 -- 2646, and then that's going to be also
15 assisting or leading into EE/CA.

16 After EE/CA is prepared, then we're going
17 to be basically summarizing the EE/CA results in
18 this action memorandum or remedial action plan, and
19 then identifying a selected remedy for the JPL site.

20 Now, on this additional data that we -- we
21 actually looked at two major items. One was
22 spinner-logging of local production wells, mostly
23 City of Pasadena wells. And for the benefit of
24 everybody, spinner-logging information gives us the
25 kind of information that we need for -- not only for

1 groundwater modeling purposes that Eric talked
2 about, but also for future production wells,
3 installation of the production wells.

4 And what that tells us that basically how
5 that flow -- what portion of that flow rate from a
6 given production well is coming from what zone, if
7 you will, within the aquifer that this production
8 well is screened into. And by also taking water
9 quality samples from the zones that we are testing
10 this flow ratio, it also gives us indication that
11 what is the quality of that water which is being
12 pulled into that well from that particular zone.

13 And that information is useful for the
14 modeling as we're talking about the dynamic sort of
15 proportioning of the flow rate, because we have an
16 aquifer that may have different zones and then --
17 and the production wells, from particularly the City
18 of Pasadena production wells, they're screened along
19 a longer, basically, thickness of this aquifer and
20 they intercept different zones. And then the
21 question is that if you have a 2,000 gpm flow rate
22 from a given production well, what portion of that
23 rate should be assigned to what unit. And that's
24 basically the value of this information.

25 We have coordinated with NASA/JPL, the

1 Navy and then City of Pasadena. We have talked to
2 vendors that they performed this type of testing,
3 and we have put together, basically, a memorandum
4 which summarizes our findings, that what is going to
5 entail to get this test done, how much it's going to
6 cost. And then we're presenting that to NASA/JPL
7 for their consideration.

8 Now, second item, which is very important
9 one, and I'll explain that, it's to perform,
10 basically, a large-scale pumping test. We evaluated
11 different options in order to perform this pumping
12 test. And again, for the -- I'll just explain a
13 little bit that these pumping tests are, as you
14 know, very important to be able to test the
15 hydraulic parameters of the aquifers that are being
16 used for drinking water purposes, or for any other
17 purposes, actually.

18 So by performing these tests, we can get
19 the kind of specific parameters, hydraulic
20 parameters that we need to calibrate the model,
21 namely, hydraulic conductivity parameters,
22 restorativity parameters, and also the ratio of --
23 the anistropy ratio, in other words, the horizontal
24 hydraulic conductivity as compared to the vertical
25 hydraulic conductivity of the aquifers.

1 Now, one of the comments that we had from
2 regulatory agencies in the past was they also
3 pointed out that the modeling work could benefit
4 from performing, basically, larger scale pumping
5 tests, and then we discussed this with NASA/JPL and
6 the Navy, and we looked at, actually, three options.
7 The option one was that to see if we can use the
8 existing monitoring wells and multi-port wells at
9 the JPL site to perform this test.

10 And just briefly, this test entails
11 designing an extraction well and screening that at
12 the specific zone within the aquifer that you're
13 interested in getting those parameters, and then you
14 need a bunch of observation wells screened in the
15 same, basically, unit and located at different
16 distances from the extraction well, that while
17 you're pumping from this extraction well, you are
18 also monitoring the response at these different
19 observation wells.

20 So that's basically what it entails to
21 design a pumping test. And then so you have bunch
22 of wells that you have to design and install.

23 So the first option was to look at, well,
24 can we use the existing monitoring wells and
25 multi-port wells at the site.

1 Second option was that if they are not
2 designed properly for aquifer testing, what's going
3 to take to, basically, perform this test, how many
4 wells, how many locations we have to do this --
5 perform this test and how much it's going to cost.

6 And third option was to be creative or at
7 least to see that given the fact that you may have a
8 very unique situation in this basin, how we can
9 maximize using the available information on a much,
10 much larger scale and then to be able to analyze the
11 information and get the type of the parameters,
12 hydraulic parameters that I just described.

13 And what we ended up doing was that since
14 option one -- very quickly, we reviewed the
15 existing, basically, monitoring wells and multi-port
16 wells and determined that, for instance, multi-ports
17 are not suited or designed for the pumping test and
18 these observation -- or these shallow monitoring
19 wells, they are not -- they're like located 300 feet
20 apart so they're not -- they are too far away from
21 the extraction to be used as observation wells. So
22 that option was basically considered not feasible.

23 Option two was very costly because it
24 involved putting in 12 or more extraction --
25 observation wells in different depths up to 600,

1 8 -- 700 feet, and it was quite costly. Half a
2 million, you know, or more. So -- and then it was
3 going to take six months to a year in order to even
4 install these and get the information.

5 So what we ended up doing was basically --
6 let me just -- we learned about this opportunity
7 that in this basin the production wells are being,
8 basically, turned off momentarily for a few days in
9 order to allow the Raymond Basin Management Board to
10 do -- to perform the monitoring of the static water
11 levels in the basin. And then they -- after they --
12 this monitoring is done, they turn, basically, these
13 production wells on and then they're back into
14 business.

15 So what we did was that we looked at,
16 basically, the monitoring wells on site, including
17 multi-port wells, and by reviewing the data, and by
18 that what I mean is that how they respond to the
19 pumping wells when the pumping wells are on? We
20 basically picked up to 18 wells that we thought that
21 those are the wells that they're sensitive enough to
22 the pumping -- production wells by the City of
23 Pasadena and also other purveyors. And then we came
24 up with a plan, present it to NASA/JPL and the
25 Navy's coordination and NASA's coordination, and

1 also their subcontractors, we basically helped them
2 to implement this monitoring of the 18 wells.

3 So what we did was that -- these are,
4 basically, the location of these wells. We have
5 Well 52 and Ventura and Windsor well, and also a
6 number of shallow monitoring wells, as well as
7 multi-port wells like MW-4, MW-3, as you can see on
8 this map. So these are the 18 wells that we sort of
9 picked and then we helped -- assisted with the
10 implementation of the monitoring of these wells.

11 Some of these wells were monitored
12 continuously. Some of these wells were only
13 monitored periodically, every two hours. And we --
14 when the pumps were shut down, we started basically
15 monitoring to make sure that we get the ambient
16 conditions, the static conditions. And then we were
17 ready, when the pumps were turned on, to continue
18 monitoring, basically, these monitoring wells and
19 recorded the information. And we are currently
20 evaluating that.

21 I have couple of slides here that shows
22 basically the results for certain wells. For
23 instance, here we're looking at MW-3. And the one
24 with the light blue color, I guess that's a deeper
25 screen. This is a multi-port well. And the pink

1 one is basically screen 2, the dark blue is screen
2 3, and the light blue is screen 4.

3 And as you -- and this is very consistent,
4 this kind of response, from one monitoring well to
5 another. As we are seeing is that the deeper screen
6 is much, much more sensitive to the pumping. And as
7 you can see, you are seeing a lot of drawdown at
8 that particular well.

9 This graph, by the way, shows groundwater
10 elevation versus time. And then you have the dates
11 on the X axis and the groundwater elevation in feet
12 in the cell on the vertical axis. And basically
13 shows that through time how the elevation of the
14 groundwater at that particular well is basically
15 being impacted by this pumping.

16 The shallower screens, as you can see,
17 they show some response, but they're not as
18 sensitive or as large as the deeper screen that we
19 have -- we were seeing for this well, as well as --
20 I have another well. This is MW-12. And again,
21 this graph is similar, shows groundwater elevations
22 versus date.

23 And then as you can see, the deeper port,
24 in this case screen 5, shows much more response.
25 Actually, 90 -- up to 90 feet of the drawdown.

1 And this basically indicates that you have
2 a very high vertical gradient and then that may be I
3 guess partially explaining why you have this
4 contamination or the wells are being impacted by the
5 chemicals in the groundwater because of the fact
6 that you have a driving force, as it's indicated in
7 these graphs.

8 Now, what we do with this information is
9 that --

10 RIPPERDA: Can I ask you a few questions?

11 NEZAFATI: I'm sorry. Yes.

12 RIPPERDA: So what wells were pumping for this?

13 NEZAFATI: We had three wells pumping. This was
14 Well 52, Ventura and Windsor and the City of
15 Pasadena wells, and also Lincoln Avenue wells.

16 And again, there were some other wells far
17 distance, you know, from the site, but we didn't --
18 by reviewing the data, we only focused on the -- on
19 the, basically, production wells that are
20 influencing these monitoring wells.

21 RIPPERDA: Right.

22 NEZAFATI: So really, the three on the City of
23 Pasadena and the two on the Lincoln Avenue.

24 RIPPERDA: How about the La Canada wells a
25 little bit upgradient?

1 NEZAFATI: I think that was also pumping and was
2 turned off in this period, and then we have
3 basically that information -- data reflect in that
4 as well.

5 RIPPERDA: And were the wells -- the City of
6 Pasadena wells and the Lincoln Avenue wells, you
7 said you were working with them. Did they all turn
8 their wells on at the same time? You got flow rates
9 for all of them?

10 NEZAFATI: We have exact, basically, timing that
11 they were turned on. They were practically turned
12 on the same time, but there are some time lags
13 between wells. But we have the charts and we have
14 the exact, basically, timing that they were -- came
15 on.

16 RIPPERDA: And they had been off for a few days?

17 NEZAFATI: Yeah. They were off for a few days.
18 I have information here, as I go by. I was a little
19 bit ahead of myself here. I was going to just say
20 that this response shows thoroughly a
21 three-dimensional groundwater flow exists and it's
22 real.

23 We looked at four model layers that we are
24 using in the -- basically, the model because
25 eventually this information needs to be feeding into

1 the model. So we wanted to be consistent with the
2 layers and figure out at which port in a given
3 particular multi- basically, port well corresponds
4 to the layer that we are going to be using in the
5 model. And then we use this information to come up
6 with 11 different aquifer parameters for four
7 layers. And namely, you have four layers or four
8 hydraulic conductivity values or transmissivity,
9 four restorativity parameters, and also three ratios
10 of horizontal to vertical, basically, hydraulic
11 conductivity, using the midpoint, basically,
12 distances between the adjacent layers.

13 So in other words, 18 wells are being used
14 to give us this 11 different aquifer parameters.

15 ZUROMSKI: We're going to do this again in
16 October as well.

17 RIPPERDA: And are you going to be able to run
18 the spinner tests in all those wells that you --
19 that are --

20 GATES: No.

21 ZUROMSKI: Yeah. We're really going to do
22 spinner tests. What the spinner logs involve, I
23 don't know, Hooshang kind of got into it, they
24 actually -- the wells have to be off and you do it
25 at the production wells. And in order to do the

1 spinner tests you actually have to remove all the --

2 NEZAFATI: Wellhead.

3 ZUROMSKI: -- wellhead, put the equipment down
4 in the well, put it back in and interrupt the
5 production schedule. So currently the only well
6 that is feasible from that standpoint is Arroyo,
7 because it's always off. So we're coordinating with
8 the City on that. But we'd also like to see if we
9 could do that for maybe some of the currently
10 producing wells. And whether we can do that or not
11 is going to depend on if we can coordinate that with
12 the City when they shut their wells down, because we
13 don't want to have to interrupt their production
14 schedule in order to do this.

15 So we're going to start with seeing --
16 right now, Hooshang -- we met with the City last on
17 Monday, and we're getting a lot of data on the
18 Arroyo Well and the other wells to see where the
19 screens are. They've been resleeved and in --
20 recently, back in '69, so we're trying to get the
21 data on where the new 20-inch sleeve is and the
22 screens in the 20-inch sleeve are compared to the
23 26-inch screen that was in the original well because
24 there may be some influences from the old screens to
25 the new screens. So we don't want to do a spinner

1 test that might not show --

2 NEZAFATI: Exactly.

3 ZUROMSKI: -- what we're looking for. So we're
4 evaluating that right now.

5 RIPPERDA: That was going to be a whole big
6 question on spinner tests.

7 Are you actually going to do it in wells
8 and will we be seeing -- and are the wells fully
9 screened, or are they screened in intervals?

10 ZUROMSKI: They're in intervals. They're in
11 intervals.

12 NEZAFATI: They're fully screened, but you have
13 some blanks in between given the fact that you have
14 some fine grain material and whatnot, and they've
15 tried to basically maximize it, targeting the more
16 coarser.

17 RIPPERDA: So when you're trying to evaluate
18 this data, how are you going to assign production to
19 the various steps?

20 NEZAFATI: The same way that basically the model
21 is going to be -- the FEFLOW is doing.

22 I was just going to say that what we are
23 using for this evaluation of this data, actually
24 it's a separate computer model called MLPU. It's a
25 Dutch model, multi-layer, basically pumping, for

1 pumping test purposes. So what it does that, it
2 basically dynamically allocates, again, this flow
3 rate between the different layers. But it's not
4 close to the spinner-logging data that you can
5 basically compare to. But based on the T values,
6 transmissivity, the thickness of the layer and then
7 initial K values that are being assumed to do the
8 inverse modeling, it assigns proportions of flow
9 rate to these different layers.

10 But it's basically something that computer
11 model does this based on the transmissivities of the
12 layers, not -- nothing compared to what you would
13 get from the spinner testing, spinner-logging
14 testing.

15 RIPPERDA: Do you at least know that the wells
16 are fully screened over these different intervals?

17 NEZAFATI: We do have that information, yeah.

18 ZUROMSKI: Uh-huh.

19 NEZAFATI: We have all this well basic
20 construction details from the City of Pasadena.
21 They are documented in the RI and FS as well. Yes.

22 RIPPERDA: Okay.

23 NEZAFATI: So this computer model, basically,
24 the way it works is that it takes the governing
25 equations for the description of the flow in a

1 three-dimensional, basically, sense and then does it
2 what we call inverse solution, which means that you
3 have to give the model the location of these
4 extraction wells, how much they are extracting and
5 also the layers that -- we have four layers in this
6 case. And then initially we have to assume
7 hydraulic values or hydraulic parameters, hydraulic
8 conductivity values, actually, and then run the
9 model to see that what kind of drawdowns the model
10 predicts at the given monitoring well that we have,
11 basically, monitored this response from the real
12 world.

13 And then depending how far the simulated
14 drawdown is with respect to the actual or observed
15 drawdown, then that tells you that -- how good your
16 initial estimates are. So model allows you to go in
17 an iterative way to come up with better estimates of
18 the hydraulic conductivity at each step to close in
19 and come up with simulated drawdowns that are very
20 close to the observed ones at these, basically,
21 monitoring wells.

22 And then at the end you have values that
23 they are basically the best values to match the
24 simulated water levels with the observed ones that
25 we have in the monitoring wells.

1 This is kind of an inverse solution type
2 approach. And the model, as I said, not only gives
3 you the hydraulic conductivity values, storage
4 coefficients, as well as the ratio of how the
5 horizontal transmissivity or hydraulic conductivity
6 is compared with the vertical one.

7 And we have done some preliminary
8 evaluation of this. Like in this graph, the
9 dotted -- the dots in three colors, blue, red and
10 black, they're basically actual observed data from
11 this MW-17, one of the multi-port wells, and the
12 different three screens.

13 But this solid black line you see is --
14 this is a preliminary result. This is just maybe
15 just initial runs that we did. And that shows how
16 the model sees the real world.

17 So, as you can see, there is a difference
18 between these dotted lines and then the solid line,
19 and that only tells you that you're there, but
20 you're not quite there, so you have to go back and
21 then basically change these parameters in such a way
22 that your simulated result, which is demonstrated by
23 this dark line as well as -- or solid dark line and
24 then solid blue and red line that you see at the top
25 for the other two screen, how does that compare with

1 the observed -- the actual information that we have
2 collected from these monitoring wells.

3 And then by going through this iteratively
4 and then in every step we're getting closer to the
5 values that they are, basically, we call it, best
6 fit to the observation wells.

7 ZUROMSKI: 17 is off that map. It's near the
8 Lincoln Avenue well site.

9 RIPPERDA: I was also wondering about 3 and 12.

10 ZUROMSKI: 3 is right in the middle of the
11 Arroyo.

12 ROBLES: 3 is here, 12 is here and 17 is right
13 here.

14 ZUROMSKI: And actually, if you look at that map
15 that Hooshang showed earlier, you can kind of look.

16 RIPPERDA: All right.

17 ZUROMSKI: You can kind of tell where they are
18 in location to each other.

19 NEZAFATI: This doesn't have the site map here,
20 but Well 17 is here, and this is MW-4, MW-3, MW-1,
21 Ventura, Windsor, Well 52 and Lincoln 5 and Lincoln
22 3. And basically, these are the other wells that we
23 have.

24 ROBLES: You can see, Mark, 17 is -- here are
25 the two Lincoln wells. Here is Arroyo. Here is 52.

1 And then here is 3, and 12 is right there. That
2 gives you a good --

3 NEZAFATI: We think that this is as close as you
4 can get to the real world. And this opportunity
5 basically -- we realized that and discussed with
6 NASA, it is really a very great opportunity that,
7 you know, you have all these production wells and
8 the monitoring wells and then you have this large
9 basin, groundwater, basically, basin and then you
10 have an opportunity to see that how, basically, the
11 aquifer behaves and then using that, basically,
12 information and reducing that to parameters that
13 we're going to be using the model.

14 But also, we're going to use the model to
15 actually, when the model is calibrated, to go back
16 and test the model and see that how the model
17 predicts -- the well model predicts these,
18 basically, observation data that we have seen
19 dealing with this pumping test.

20 And we are calling that pumping test,
21 because what's a pumping test? Again, you have a
22 bunch of production, extraction wells and
23 observation wells, but nothing in this scale. I
24 mean, this is really as large a scale as you can get
25 and as real as you can get to a real world

1 situation. Because otherwise, as you know, you have
2 to basically have some extraction wells and
3 observation wells and you only, again, get,
4 basically, to test only a portion, maybe a smaller
5 portion of the aquifer as compared to what we have
6 been able to test here, which is much larger, you
7 know.

8 And then we're very, I guess, comfortable
9 with this information and we think that this is --
10 we're going to be getting a lot out of this
11 information in the future to calibrate the model and
12 also adds a lot of credibility to the model results
13 and makes the model results more defensible, because
14 nobody can argue that, well, you know, there is no
15 pumping test anymore, and then also the scale of the
16 pumping test that we manage to perform at the site.

17 ZUROMSKI: Actually, Mark, if there's data that
18 after we do this you see that -- you think that
19 maybe we need to look at, we're going to do the same
20 exact thing again in October when the Raymond Basin
21 shuts down again. And we'll have all the same wells
22 and everything ready to go.

23 If there's things that you think that we
24 should look for that maybe when you see the results
25 that we didn't, you know, please let us know and

1 we'll make sure that we look at them because we're
2 going to have an opportunity to do this again and
3 include it in the data that we're going to be
4 submitting to you.

5 NEZAFATI: Actually, along the same lines, we're
6 going to be documenting this, this whole exercise
7 of, you know, monitoring and analysis and results
8 and all the assumptions, and whatnot, in a technical
9 memorandum. We're going to be presenting that to
10 NASA/JPL and the Navy and regulatory agencies. And
11 we encourage you, and we are very anxious to,
12 obviously, gain some feedback and comments back from
13 you. As Richard say, we could use that in the
14 future events and make sure that we consider some of
15 the concerns or questions that you might have in
16 more detail.

17 So let me see.

18 ARONSON: That was me.

19 NEZAFATI: Oh, that's yours, then. So with
20 that, I guess, if you have any questions.

21 I don't know if I answered your question
22 regarding that other pumping wells that -- actually,
23 the senior hydrogeologist that did this testing
24 model was Fritz. He couldn't be here. But looks
25 like that those wells -- La Canada, you said?

1 RIPPERDA: Yeah.

2 NEZAFATI: They may have been -- they are not
3 included, it looks like, because I didn't see that
4 in that map. And it could be that by analyzing the
5 historical data we figure that they're not really
6 influencing these monitoring wells.

7 RIPPERDA: That's why I wanted to see where your
8 monitoring wells were, because La Canada is pretty
9 far away.

10 NEZAFATI: Far away. Exactly.

11 ZUROMSKI: We have 13 here and 10 here, which
12 were both part of the test. And I guess the only
13 other ones that in the future that if we did want to
14 see in the next test would be 6 and 14, we could
15 probably look at to see if there was any influence
16 from upgradient.

17 NEZAFATI: Exactly.

18 ZUROMSKI: We could also look at any influence
19 when we know that they're injecting water as well,
20 to see both extraction and injection --

21 NEZAFATI: Exactly.

22 ZUROMSKI: -- things that we could look at.

23 NEZAFATI: And obviously, we were also -- not
24 limited, but we wanted to be cost effective and we
25 didn't want to really, you know, monitor a bunch of,

1 you know, monitoring wells if we don't get the
2 value -- the valuable data that we think we're going
3 to be getting.

4 So what we have done -- it shouldn't be
5 basically looked at as this was the only option or
6 plan or number of monitoring wells that we could
7 have monitored. But we did the best we could by
8 going back to the historical data and then
9 reviewing, basically, the periods within the year
10 that these pumping production wells are very active
11 and looking at these monitoring wells and time
12 series of, basically, the water level measurements
13 and then making an evaluation that, well, which
14 wells are more sensitive and then using, basically,
15 or picking those wells as the first phase of this
16 investigation.

17 But we're very happy, actually, that we
18 had this opportunity to collect this information,
19 and then we think that we're going to be getting a
20 lot of value out of this information for the
21 modeling purposes and then down the road, I'm sure
22 for other purposes as well.

23 ROBLES: Okay. Next. What else do we have?

24 ZUROMSKI: Do you have any other -- do you have
25 any other questions here? Okay.

1 RIPPERDA: No.

2 ZUROMSKI: That's the general -- that's the big
3 part of what we're working on at this point in time.

4 Agenda Item Number 2 is Operable Unit 2.

5 I gave you some -- there's four bullets. And I gave
6 you the first three dates earlier. Public meeting
7 number three is going to be on the 20th of this
8 month. And our responsiveness summary will be
9 coming in after that, in July, and the draft ROD in
10 August as well.

11 Pilot Study Operations. We currently just
12 shut the pilot study down. We had asymptotic levels
13 about a month ago and we were really drawing much
14 more VOCs out of the ground at this point. So we
15 shut down. And right now we're going around the
16 site and looking at -- we have a lot -- there's a
17 large monitoring network on this site and soil vapor
18 wells that were originally monitored back when they
19 did the RI that haven't been monitored for a while.
20 So we're trying to look at which ones are available
21 that we can monitor that still have a vacuum
22 response to see for our expanded pilot study where
23 we would place additional extraction wells in the
24 future. So we're going around and looking at that
25 right now to put that together and submit to you a

1 workplan for expanding the soil vapor extraction
2 study. But that's ongoing. And like I said,
3 hopefully by August time frame we'll have that plan
4 submitted to you as well.

5 We did the modeling demonstration, which
6 was Item Number 3.

7 And Item Number 4 is Pilot Studies. As I
8 said, pilot study for SVE has been shut down right
9 now, and we will be -- we'll be doing our regular
10 monitoring of the soil vapor wells to see if the
11 levels come back up and whether or not we're going
12 to turn that well back on or where we're going to
13 put other wells at this point.

14 The packed bed reactor pilot study that
15 we're doing up in OU number 1 right now is shut
16 down, and we are -- I was hoping that David would be
17 here today because we're still having some issues
18 with discharge of treated water from that system.
19 And David was going to be talking with, I guess, the
20 County Sanitation District to see if we could
21 discharge the water from that system to the
22 sanitation -- to the sanitary sewer. And, you know,
23 unfortunately, David is not here today, so I don't
24 know what the status of that is right now.

25 But we're shut down not only because of

1 that, but we're reconfiguring the reactors right now
2 with some different packing materials and
3 different -- and loading them with -- we found that
4 one of the first results that we received from that
5 test was that the JPL bacteria that we isolated from
6 the aquifer here was the most successful in the
7 reactors, and the other two were successful as well.

8 And one of the results from the test so
9 far has been that the choice of the bacteria that
10 you use initially really is not of great concern in
11 these tests, because all of them seem to reduce
12 perchlorate very, very effectively. So since we've
13 eliminated that parameter from our test, we're now
14 going to just focus on the packing materials and
15 flow rates through the reactors, but using the JPL
16 bacteria. So we're reconfiguring that right now
17 while we're waiting for David's response as well, so
18 it's kind of given us a chance to get all that
19 together. And we'll be restarting that over the
20 next few weeks as well.

21 And then the in-situ pilot study, we still
22 are planning on doing that. Some of the things that
23 we're dealing with right now are -- there's some
24 conflicting data out there. In-situ degradation of
25 perchlorate is fairly new, and one of the issues

1 that we're dealing with right now is what is the
2 correct electron donor to add to the subsurface to
3 stimulate the in-situ degradation of perchlorate by
4 the bugs.

5 And from our initial microcosm tests,
6 there were a suite of different donors that were
7 going to work, the most effective being acetate.
8 Some new data came out. There's a contractor that
9 Arcadis, Geraghty & Miller, who has worked here
10 before, has said that maybe molasses was a better
11 one to use. But then there's some conflicting data
12 with another new study that came out that said maybe
13 molasses doesn't work.

14 So in selecting the right contractor and
15 also the contractor who knows how to use the correct
16 electron donor, we're trying to make sure that what
17 we do inject into the ground is going to be
18 effective in stimulating the bacteria.

19 So that's kind of where we are in
20 evaluating that right now. But that is still
21 planned for going ahead and doing that for source
22 reduction up in -- towards the Monitoring Well 7
23 site. So we are going to do that. It's just a
24 matter of make sure we select the correct donor, the
25 correct contractor, and then also the adequate

1 delivery system and extraction system as well.

2 RIPPERDA: I forget. What are you using in the
3 packed bed reactor?

4 ZUROMSKI: Packed bed reactor, the ones where we
5 had the JPL isolate bugs we were using acetate,
6 which we found was the most effective for the ones
7 on site. And then in the -- another one we're using
8 ethanol, which was similar to the U.S. Filter
9 fluidized bed reactor because we're using a similar
10 type of bacteria in there. So both acetate and
11 ethanol.

12 The problem with the both of them is that
13 they're both very expensive. So we're trying to
14 find something a little more -- something that's
15 less commercial, like molasses or lactate or things
16 that would be a lot less expensive for a large scale
17 type of system.

18 So though acetate is very effective, it's
19 a lot more expensive. To try to see -- balance, you
20 know, which ones work the best with cost
21 considerations. Also, with molasses, there may be
22 some issues with being able to actually deliver it
23 into the aquifer and seeing what kind of radius of
24 influence you can get. That's another issue as
25 well. But the ones up there right now are

1 using -- the one we will be continuing will use
2 acetate as the electron donor.

3 So that's the status of all our current
4 pilot studies.

5 Item Number 5 is the EE/CA. Hooshang gave
6 you a status on that for the most part. As you
7 know, we're trying to do -- go through the
8 non-time-critical removal process right now because
9 it's going to be a lot quicker in getting to our
10 results. And so we should have our -- we're going
11 to be working on putting the data from the modeling.

12 They're currently working on their
13 evaluation of the different technologies for ex-situ
14 reduction of perchlorate. And all of that is being
15 put together into the internal draft for EE/CA,
16 which you'll be getting probably before the next RPM
17 meeting. And then once we get our -- we look at it,
18 take a look at it, we'll be submitting that to you
19 shortly after. So that's the story on the EE/CA.

20 RIPPERDA: And the EE/CA is focusing only on a
21 single extraction well and just to capture the
22 plume. It's not looking at it --

23 ZUROMSKI: Right. Single or two, depending
24 on -- right. The EE/CA will focus on capture of the
25 plume and treatment of that groundwater on site and

1 then reinjection into the aquifer, and we'll focus
2 on looking at possible replacement well for the
3 Arroyo Well as part of that whole package. And
4 that's, again, being put into the model.

5 We went -- on Monday we went and walked
6 around the City of Pasadena. Folks -- the -- Brad
7 Bowman and Gary Takara from the City, and we went
8 around to the sites that they're proposing that they
9 showed us on that map that one day. We went to each
10 of the sites, looked at the sites, looked at what
11 was there. Right now the -- two of the sites have
12 wells, but the wells are no longer in use because
13 of, I guess, a couple of the casings are cracked or
14 crooked or broken. So we looked at what was
15 available, what's currently there. We're also going
16 to do some water level measurements at those sites
17 and try to see -- evaluate those sites as potential
18 sites as well.

19 So that's part of that, again, trying to
20 all feed all of this into the EE/CA to get to our
21 one common -- you know, to get to the action
22 memorandum, which will say this is what we want to
23 do with the -- for the removal action. So that's
24 the EE/CA.

25 Item Number 6, and since you're the only

1 one here and you're the only one -- or actually, I
2 guess David was there, too. I just was going to
3 maybe really try to inform Richard and give
4 everybody an update of, you know, we met with the
5 City and what we -- basically what we discussed on
6 replacing their well. But there's really -- that's
7 really the only -- from that meeting the only things
8 that have come out of that so far is that we have
9 had subsequent meetings, two subsequent meetings
10 with the City. One we had -- Peter and I had a
11 conference call with them to discuss to make sure
12 that we were moving on our action items.

13 And then again this Monday we had -- we're
14 meeting every two weeks, whether that's on a
15 conference call or a face-to-face meeting. And so
16 this week on Monday we went out -- we went to their
17 office and we did a pretty good data collection with
18 them. Hooshang went with us because we wanted to
19 make sure that we're getting all these well logs and
20 production data from -- you know, history until the
21 present. And then we went around to all the sites.
22 We also looked at the Arroyo Well site for possible
23 spinner-logging and for, you know, a possible site
24 for our extraction well for the removal action. So
25 that's what's going on with the City right now.

1 RIPPERDA: Have you been talking about money
2 with the City?

3 ROBLES: We haven't discussed like the issues of
4 compensation and so on. That has been the attorneys
5 getting together.

6 RIPPERDA: Right.

7 ROBLES: What we've discussed is basically the
8 engineering.

9 RIPPERDA: Right.

10 ROBLES: What we wanted to do was ask them what
11 property would they be looking at for a replacement
12 well location. We want to help them by doing a
13 modeling to make sure that where it's decided to put
14 a replacement well would be okay, because we don't
15 want to trigger into another area or zone of
16 contaminants.

17 The issue of the replacement well I think
18 has been settled, more or less.

19 ZUROMSKI: Yeah.

20 ROBLES: I think that's part of our game plan.
21 We do have the go-ahead from the headquarters people
22 to look at that. And I don't think that's an issue.

23 The key is the compensation and lost
24 opportunity issues are -- that's going to be the
25 lawyers deciding that, their attorneys and NASA's

1 attorneys getting together. But from the standpoint
2 of the actual EE/CA remediation and, I believe, the
3 replacement well, that's a go.

4 On the issue of the vapor --

5 ZUROMSKI: Air stripping.

6 ROBLES: -- the VOC vapor extraction plant, we
7 are going to continue that agreement. We are
8 working with the City of Pasadena and Cal Tech, who
9 the agreement is with, and we've given Cal Tech the
10 go-ahead to open up those negotiations, get that
11 going, extend the agreement past September 30th,
12 which is the last date for that.

13 RIPPERDA: And why leave that one little part
14 through Cal Tech instead of bringing that into NASA?

15 ROBLES: If we brought it into NASA, we might go
16 past the expiration date of the agreement.

17 ZUROMSKI: Right. Because basically, we're
18 extending what they already have.

19 ROBLES: So we're going to bring it back. But
20 for now, to facilitate the extension, it's easier to
21 keep it within Cal Tech, since NASA is paying it
22 anyway through Cal Tech, is to have that agreement
23 go through and extend it with, we're thinking, three
24 one-year options until we get the EE/CA and until we
25 get the record of decision for Operable Unit 1 and 3

1 and then bring it back within NASA. And the NASA
2 agreement is part of the whole record of decision.
3 But for now the issue is that there is an expiration
4 date of the 30th of September for that agreement.
5 And so the fastest way to continue that, and that
6 was one of their concerns, are we still going to be
7 supporting them on that and we said yes, we are. We
8 want to continue that. That's the only reason for
9 that, Mark.

10 RIPPERDA: Okay.

11 ZUROMSKI: And so that's everything on Item 6.

12 Item 7. Does anybody have any other items
13 or issues that they'd like to raise? I know -- I
14 think we've covered pretty much everything that
15 we're working on right now.

16 Can you think of anything else that we
17 were going -- we've had a couple meetings. We -- on
18 Tuesday we went down to CH2MHILL. They gave us an
19 all-day briefing on what you saw today, only in a
20 lot greater detail.

21 Change the tape real quick.

22 And they went through basically to give
23 the customers an update of what's -- what they're
24 working on because we've tasked them with, as you
25 could see, a lot of things, working on the model,

1 working on the EE/CA, working on the evaluation of
2 the different technologies. They're also doing the
3 regulatory analysis that we've talked about for
4 97-005 and the new bill, which is no longer 2646,
5 but it's another bill. I forget the number.

6 NEZAFATI: AB 378.

7 ZUROMSKI: Okay. The other one was --

8 NEZAFATI: Died.

9 ZUROMSKI: -- died in the Senate last year, so
10 they reupped it. It's the exact same bill, only
11 it's a new number now.

12 What else are you guys doing? I think we
13 went over most of that. But anyway, we went over
14 that in fairly good detail on Tuesday to get an
15 update. And to find out what they're doing they
16 brought in all their folks that are working on the
17 project. As Hooshang said earlier, the 12
18 professionals did include Eric. And they did do
19 the --

20 NEZAFATI: Including.

21 ZUROMSKI: Right. And they gave us a -- they
22 gave us a really good update of where they were and
23 the status of their project. Because, as you know,
24 we're trying to push our time line along as quickly
25 as possible to get our extraction system in, get

1 this, you know, removal action moving.

2 ROBLES: You had a meeting with NASA
3 headquarters.

4 ZUROMSKI: I had a meeting with NASA. I was at
5 NASA headquarters last Wednesday -- or Tuesday and
6 Wednesday.

7 On Tuesday I briefed NASA headquarters on
8 all the work we're doing. They are very much
9 supportive of all the work that we're doing.

10 And then on Wednesday I gave a brief to
11 the Federal Remediation Technologies Round Table on
12 all the different treatment technologies and things
13 that we're working on for perchlorate. And it was a
14 very good meeting because it included folks from all
15 the Department of Defense services, plus other
16 government agencies, such as NASA. NASA actually
17 chaired the meeting and they invited me to talk.
18 That's why I went to that meeting. And then
19 Department of Energy, Department of Interior.
20 Everybody who has any type of involvement in
21 perchlorate. This was specifically on perchlorate.
22 And also EPA was there.

23 Do you remember the gentleman's name that
24 gave a good talk on both the status of the action
25 levels or MCLs for perchlorate, and also for -- no.

1 I forget his name, too.

2 RIPPERDA: Kevin Mayer?

3 ZUROMSKI: Kevin Mayer. Exactly. He gave a
4 good update on what was going on from the EPA side.
5 So it was a very, very informative meeting. Got a
6 lot of information on, basically, state of the art
7 on perchlorate at the time. So that was a good
8 meeting to go to.

9 And I think that's generally everything
10 we've been working on.

11 I guess I could almost go back to Item
12 Number 2, just give you a quick update on the public
13 meeting. Everything is ready to go.

14 Did you get your mailer in the mail at
15 all? I don't know if you're even on that mailing
16 list or not. But everybody I know in the public has
17 gotten their mailer. So (UNINTELLIGIBLE) if you're
18 not on our mailing list. You didn't get -- the
19 mailers did go out and we didn't get them all back,
20 so we know they went out this time.

21 And we have our newspaper announcements
22 going in. We have both -- some of the newspapers we
23 only did a legal ad because of whatever reason.
24 Some of the newspapers didn't have a good time line
25 for doing a nice ad. But we did get a large -- in

1 the general section, the front page section of the
2 Pasadena Star News we got a general ad in that paper
3 to announce the public meeting. Since that's
4 probably the largest distribution around here, that
5 was probably our best bet.

6 And then we are also going to do -- a
7 couple of public service announcements are coming up
8 on some local radio stations. And then the two days
9 before the public meeting, the Monday and Tuesday
10 before, that would be the 18th and 19th, we actually
11 have some radio ads running on some of the local
12 stations on those days as well.

13 We're going to be -- we're trying to get
14 our final coordination with our folks at Cal Tech to
15 get our e-mail sent out to all the people here on
16 site. And then we're also having coordination to
17 get this -- you know, when we go to the cafeteria
18 they have all those monitors. We're going to have
19 all the monitors showing for several times the
20 announcement of the public meeting as well. I think
21 we've done a pretty good job of getting the word out
22 this time.

23 ROBLES: And then we're also going to use the
24 Raymond Basin --

25 ZUROMSKI: And the Raymond Basin.

1 GATES: Yes.

2 ROBLES: -- to notify every one of their people.

3 ZUROMSKI: Right.

4 ROBLES: Particularly Lincoln Avenue, Pasadena.

5 ZUROMSKI: Right. We'll brief them.

6 RIPPERDA: That won't be able to happen.

7 ZUROMSKI: There won't be a mailer this time,
8 but we will brief them and they can -- when they
9 have their board meetings, et cetera, they can brief
10 their folks and let them know what's going on. But
11 as far as actually putting in a mailer, we're going
12 to do that for the groundwater remedies for the
13 site. But that will be in the future.

14 And that's generally everything we're
15 working on right now.

16 RIPPERDA: How about the Pasadena Weekly, since
17 they did such a nice piece on you a year or two ago?
18 Are you going to advertise with them, give them
19 money?

20 ZUROMSKI: Who is that?

21 ROBLES: Pasadena Weekly.

22 RIPPERDA: Whatever it's called.

23 ROBLES: Pasadena Star, you mean?

24 WOODWARD: No. It is Weekly. It's the one that
25 did the article.

1 RIPPERDA: It's the weekly paper that --

2 ZUROMSKI: No, no, no. That's the regular
3 Pasadena Star that did an article on us.

4 GATES: Oh, is it? Oh.

5 RIPPERDA: I was being facetious, because it
6 made you guys look like you were poisoning the
7 children.

8 ZUROMSKI: You mean from the last public
9 meeting?

10 RIPPERDA: Oh, no. This was about a year ago.

11 WOODWARD: This was a general article.

12 GATES: Oh.

13 ZUROMSKI: I've never seen that, so I don't
14 know. I don't know.

15 GATES: There was an article in the Pasadena
16 Star --

17 ZUROMSKI: There was an --

18 GATES: -- after this last public meeting.

19 ZUROMSKI: And that was a good one, so I don't
20 know.

21 GATES: Yeah. That one came out well.

22 ZUROMSKI: So that's why I was confused. I
23 didn't know what you were talking about.

24 RIPPERDA: How is the model calibration going?
25 Are you guys pretty far along? Are you almost done?

1 Are you just getting started?

2 ROBLES: Getting started.

3 RIPPERDA: Have you even gotten started?

4 ARONSON: We're getting started right now.

5 Basically, we've done a little bit with -- run the
6 model probably six or eight times. But still
7 pinning down some of the other types of information.

8 ZUROMSKI: And part of it is interpreting the
9 pump test data into the model and replacing values
10 that were used from the old Foster Wheeler model
11 with the new values that we're receiving from the
12 pumping tests.

13 You know, part of that is -- I don't know.
14 We did never receive comments from any of the
15 agencies on the workplan and we maybe waited a
16 little bit too long to see whether we were going to
17 get comments on the workplan before we actually
18 started working on the model. But at a certain
19 point in time we did just give CH2MHILL the go-ahead
20 to get going. I'm not sure. Are we going to -- I
21 didn't think we were going to receive comments on
22 that.

23 RIPPERDA: I kind of said this at the public
24 meeting where it's like it's a workplan, things look
25 pretty good, like maybe my contractor would have a

1 few specific comments --

2 ZUROMSKI: Yeah.

3 RIPPERDA: -- but didn't get any and I read
4 through it and --

5 ZUROMSKI: Okay.

6 RIPPERDA: -- like can't really -- it's like
7 "Yeah. Fine."

8 ZUROMSKI: I know that Richard said that he
9 wasn't going to have any comments. David said one
10 of his hydrogeologists or somebody was going to have
11 some comments, but they didn't -- we haven't
12 received anything from them, either. So that's why
13 they're pushing forward now full steam. And if you
14 do have any comments, you know, along the way that
15 we need to put in, you know, just let us now.

16 RIPPERDA: So how long do you think it's going
17 to take before you are ready to be running it for
18 real?

19 ARONSON: Running it for real? It's obviously
20 going to depend on -- you know, it's a very dynamic
21 site. We're obviously -- we have a fast time
22 schedule, so we'll have to be getting it done
23 probably in the next month. What is today? Like a
24 month, right around there, to be able to start
25 scenarios. But it will be -- you know, the

1 particular time will be driven very much by the
2 complexity in calibrating it, really.

3 ZUROMSKI: I think one of the delivery dates,
4 that was like the end of August or something like
5 that for the final everything model.

6 ARONSON: Correct.

7 ZUROMSKI: But they'll probably have it -- I
8 think what Eric is saying, they'll probably have it
9 done and rolling before then.

10 ARONSON: Yeah.

11 ZUROMSKI: When we actually -- they are doing
12 simulations and simulations that will be included in
13 the EE/CA for the pumping scenarios. Those are all
14 supposed to be done, I guess, the end of August or
15 so --

16 ARONSON: Right.

17 ZUROMSKI: -- depending on how the calibration
18 goes.

19 RIPPERDA: If you're going to get the draft
20 EE/CA to us in early October --

21 ZUROMSKI: Yeah. Right.

22 RIPPERDA: I could see having different levels
23 of complexity or different goals in your calibration
24 model, you know, for placing the extraction well
25 which, okay, we know it's going to go about where

1 the Arroyo Well is, and placing an injection well.

2 It looks like your calibration just
3 doesn't need to be that good. You could almost just
4 run a 1-D infinite system, almost, to kind of see,
5 well, where best to place things. You know, I'm
6 being a little gross here. But you actually don't
7 need that well a calibrated system to look at that,
8 I don't think.

9 But down the road, when you start to look
10 at long-term plume migration or maybe at in-situ
11 remediation and where you're going to put your
12 acetate or molasses, how much are you going to put
13 in, are you going to put in multiple wells. You
14 know, at that level you need much better
15 calibration. So when you said that you've got like
16 a date in August for final completion of
17 calibration, you know, I hope that doesn't mean that
18 you'll never, then, go back in and continue to tweak
19 or calibrate or fine tune.

20 ZUROMSKI: I'm just talking about delivery for
21 getting -- placing -- well placement and things like
22 that.

23 ARONSON: Supporting the EE/CA.

24 NEZAFATI: I'm glad you cleared it up, Mark. So
25 yeah. Basically, for this EE/CA, everything is

1 being driven by the schedule for EE/CA. So we're
2 trying to really, as Peter put it the other day, be
3 more creative or out of the box and try to calibrate
4 the model to the extent that we can use that for
5 EE/CA. But we're going to have to, basically,
6 (UNINTELLIGIBLE) the model at later time for the
7 different kind of applications that we're going to
8 have in the future.

9 RIPPERDA: Right. I saw you frown when I said
10 "Oh, a 1-D infinite model worked just as well as
11 your like months of painstaking effort." But, you
12 know, in some ways it's true since the placement of
13 both the extraction well and the injection well are
14 going to be heavily driven by land use and
15 availability concerns.

16 NEZAFATI: Exactly.

17 ARONSON: It does limit that.

18 RIPPERDA: What you're really looking at is just
19 kind of a gross, you know, there, there --

20 NEZAFATI: Yeah.

21 RIPPERDA: -- or, you know, there kind of
22 scenario. And in that system, you know, it doesn't
23 matter how closely you've calibrated, you know,
24 these drawdown curves between MW-3 and Well 52.

25 ARONSON: Sure.

1 RIPPERDA: It's just not that important.

2 ARONSON: Yeah. It's just more a reaction to
3 1-D versus -- you know, there, there and there is
4 2-D. So I was thinking just, you know, in the sense
5 that a little bit of the spatial location,
6 obviously, plays into it. And it's not just sort of
7 down the pipeline issue.

8 ZUROMSKI: And that's kind of somewhat also the
9 reasons with the spinner-logging right now. It's
10 what we can get done in a reasonable time frame
11 rather than, you know, over the long term. Because,
12 you know, if we can't do the spinner-logging and we
13 can't interrupt the City's production schedule right
14 now, that's not going to stop us from moving forward
15 with the EE/CA, because it can't. So -- but if we
16 can do it, it would be a luxury to get that data,
17 and that would be great. So we're pushing forward.
18 If we can get that data, we can. If not, we're just
19 moving forward with what we're doing.

20 ROBLES: Okay.

21 ZUROMSKI: And actually, one other thing on that
22 was -- I mean one thing that came out of our meeting
23 with the City was that they've already resleeved the
24 Arroyo Well, and possibly even using a resleeved
25 Arroyo Well as the site for the extraction system is

1 another thing we're now considering, because that's
2 a whole 'nother option that we're now possibly
3 throwing into the mix, which could save a lot of
4 money and a lot of time.

5 So try to, you know, like Hooshang was
6 saying, think out of the box, what are the best ways
7 that we can do this quickly, you know, inexpensive,
8 if possible. Of course, treating for perchlorate is
9 not completely inexpensive, but try to get out
10 there, get stuff into the field, what's the best way
11 we can do it. So any options that we can think of
12 we're throwing in the mix.

13 ROBLES: Okay. If nobody has anything else,
14 when do we want our next meeting?

15 ZUROMSKI: I guess it would be September, first
16 week of September.

17 ROBLES: September. September 6th is the first
18 Thursday of the month.

19 ZUROMSKI: Does that sound good to the few
20 people that are here?

21 RIPPERDA: Yeah.

22 ROBLES: All in favor, say. That's Mark.

23 ZUROMSKI: Okay. Well, we'll shoot for
24 September 6th, then, at 9:30, same time, same place
25 as our next meeting.

1 RIPPERDA: And next conference call?

2 ZUROMSKI: The next conference call will be --

3 let me see, now.

4 ROBLES: I believe we need one in July.

5 ZUROMSKI: First week of July?

6 ROBLES: No, because that's the 5th.

7 ZUROMSKI: 5th.

8 ROBLES: That's not a good day. That's after

9 Independence Day.

10 ZUROMSKI: Should we do it on the 12th?

11 ROBLES: How about the 12th?

12 ZUROMSKI: 12th of July.

13 ROBLES: Would that be okay? That's the second

14 Tuesday -- Thursday.

15 ZUROMSKI: Second Thursday of July.

16 RIPPERDA: Yeah.

17 ROBLES: So let's do an RPM telecom.

18 ZUROMSKI: And then one in August as well.

19 ROBLES: And the one in August. We have -- the

20 first Thursday of August is the 2nd.

21 RIPPERDA: Okay.

22 ROBLES: All right?

23 ZUROMSKI: Great.

24 ROBLES: Okay.

25 ZUROMSKI: Okay. Well, does anybody have any

1 other final issues? Okay.

2 ROBLES: I just want to impress on you that we
3 are trying to get the EE/CA as soon as possible. We
4 did -- through Richard's briefing of NASA
5 headquarters, they looked at it real well and they
6 are pressing for that. They want something done as
7 quickly just as much as we do, and we're trying
8 every which way to meet that need. And we're
9 working with the City of Pasadena. We're not doing
10 this in a vacuum. So --

11 ZUROMSKI: NASA is actually very supportive of
12 what I proposed to them. So --

13 RIPPERDA: And what -- is it AB 378? Is that --

14 NEZAFATI: 378, yes.

15 RIPPERDA: What's the exact -- not the exact,
16 but what's the gist of the language in that?

17 ZUROMSKI: It's the one --

18 GATES: Same thing.

19 NEZAFATI: They're basically authorizing the
20 water districts to negotiate or do the remedial work
21 for contaminated wells, in a nutshell. But I'm not
22 quite, you know, clear on the --

23 ZUROMSKI: Yeah.

24 NEZAFATI: -- specifics.

25 ZUROMSKI: It gives the Regional Board -- it

1 gives the water purveyors some power to work with
2 the Regional Board over where water can be extracted
3 and injected for remediation systems so that -- for
4 example, I think the one idea behind the law was to
5 alleviate problems like they had I think in either
6 Sacramento or one of the AeroJet sites, I think,
7 where they were reinjecting contaminated water.
8 Before they knew about perchlorate, they were
9 reinjecting it and basically expanding the size of
10 the plume. So the whole idea is to have them as
11 input into the coordination with the Regional Board.
12 Basically, it makes that official even though we're
13 doing that, really, already by updating the Raymond
14 Basin all the time. So it just gives them official
15 -- a little more, you know, power or teeth in the
16 whole mix. And so that's going to possibly affect
17 what we do as well.

18 RIPPERDA: And this is going back quite a ways.
19 At least I don't go back as far as you, but I'm
20 going back a ways for me. It wasn't Alex, but it
21 was somebody else from the Regional Board, I think,
22 was basically saying that you can't reinject into a
23 drinking water aquifer, which isn't AB 378.

24 ZUROMSKI: No.

25 RIPPERDA: That's just kind of a Regional Board

1 anti-deg policy.

2 ZUROMSKI: Right.

3 RIPPERDA: And like, oh, you can do infiltration
4 basins, but you can't reinject.

5 ZUROMSKI: Right.

6 RIPPERDA: Is the Regional Board --

7 ROBLES: That's one of the things that we --

8 RIPPERDA: -- still talking about that? I
9 haven't heard David or Alex say that in a year and a
10 half, but it is something that's still kind of out
11 there?

12 ROBLES: It is still kind of out there. The
13 person that we were talking to is the director for
14 the L.A. Regional Water Quality Control Board. I
15 can't remember his name now. And we're looking at
16 that as one of the major issues, whether it's
17 infiltration or reinjection. We would like to do
18 the reinjection. But we would have to coordinate
19 with them on that.

20 I believe we can get through that. It's
21 just a matter of getting it, really, through the
22 Raymond Basin Board as well. I think both are the
23 two hurdles.

24 So far, talking on reinjection, they don't
25 seem to have a problem with that. Their biggest

1 concern, this was from the City of Pasadena calling
2 us, if we're going to reinject or reinfiltrate the
3 location, to make sure that we're not going through
4 a contaminated site. We're telling them that we're
5 going on our property and, basically, we want to do
6 reinjection cleaner than what we got it out so that
7 we can have a closed-loop system and also avoid the
8 non-degradation issues.

9 The question about the non-degradation
10 issue is the bigger concern, and so we have CH2MHILL
11 looking at that, that the Basin Plan says you have a
12 limit. Sometimes it's more stringent than the MCLs.
13 And even though you're pumping it out of the
14 impacted groundwater and you're cleaning it up, and
15 you're even meeting MCLs, but the policy is much
16 more stricter. And that's a concern for us, how do
17 we do that and meet that. And we're trying to work
18 that internally and make a presentation to you and
19 the other RPMs to see what we need to do to resolve
20 that in one sense.

21 ZUROMSKI: Yeah. I guess there have been some
22 variances. You know, we're really specifically
23 alluding to chloride, sulfate and TDS. And there
24 have been variances for reinjecting that. So we're
25 hoping that that's something that's going to work

1 for us as well.

2 ROBLES: See, the question is, focusing on the
3 contaminants, cleaning those up, these other
4 noncontaminants, but also issues that are of a
5 concern for non-degradation, do you add that on,
6 because then it's a cost issue and also, more
7 importantly, you can't clean them up to what the
8 Basin Plan says. Then you've got a problem. Then
9 that voids the reinjection issue and then we've got
10 a real big problem. So we're looking at those.

11 Okay?

12 RIPPERDA: Yeah.

13 ZUROMSKI: I think that's it.

14 ROBLES: I think that's it.

15 ZUROMSKI: The meeting is adjourned.

16 (Adjourned at 11:34 a.m.)

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